

CLAIMS

1. A printing apparatus (10) including a carrier ribbon supply spool (12) and a carrier ribbon take-up spool (16), a print head (22) having a plurality of heating elements which are individually addressable and energisable selectively to remove pixels of marking medium from the carrier ribbon (14) during a printing operation, a first motor (13) which when the printing apparatus (10) is operated in a first configuration, moves the print head (22) during a printing operation relative to a substrate (15) on which an image is to be printed, and when the apparatus (10) is operated in a second configuration, the first motor (13) moving the carrier ribbon (14) relative to the print head (22) during a printing operation, and there being a second motor (25) which is operative when the printing apparatus (10) is operated in the first and second configurations to advance carrier ribbon (14) from which pixels of marking medium have been removed in a previous printing operation, onto the carrier ribbon take-up spool (16), the printing apparatus (10) being configurable to either of the first and second configurations.

2. An apparatus according to claim 1 characterised in that the first motor (13) moves the print head (22) when operated in the first configuration and the carrier ribbon (14) when operated in the second configuration, via a transmission (26, 27), the carrier ribbon (14) being disconnected from the transmission (26, 27) in the first configuration and the print head (22) being disconnected from the transmission (26, 27) in the second configuration.

3. An apparatus according to claim 2 characterised in that the transmission (26, 27) includes a rotary to linear drive transfer mechanism whereby in the first configuration the print head (22) is carried by a linearly movable part (27) so as to be moved linearly during a printing operation along the carrier ribbon (14),

and in the second configuration the carrier ribbon (14) is entrained around guides (35, 36) on the linearly movable part (27) and around immovable guides (17, 37, 38, 39) so that as the linearly movable part (27) moves during a printing operation, the carrier ribbon (14) is moved relative to the print head (22).

4. An apparatus according to claim 3 characterised in that when the printing apparatus (10) is operated in the second configuration, and the substrate (15) moves relative to the print head (22) in a first direction (A), the linearly movable part (27) is moved in a second linear direction opposite to the first direction (A) to move the carrier ribbon (14) in the same direction as the substrate (15) and vice versa, and where the substrate (15) moves in the first direction (A), inbetween printing operations, a length of the carrier ribbon (14) is moved past the print head (22) which is generally equal to the length of carrier ribbon (14) used in the preceding printing operation plus the length of carrier ribbon (14) to be used for the next printing operation.

5. An apparatus according to claim 4 characterised in that when the substrate (15) moves relative to the print head (22) in a second direction opposite to the first direction (A), inbetween printing operations the carrier ribbon (14) is generally stationary relative to the print head (22).

6. An apparatus according to claim 5 characterised in that there is a peeler device (24) associated with the print head (22) which is operable to assist in the removal of pixels of marking medium from the carrier ribbon (14) and when the apparatus (10) is operated in the second configuration and the carrier ribbon (14) and substrate (15) are moved in the first direction (A) relative to the print head (22) during a printing operation the print head (22) and associated peeler device (24) are positioned in a first position such that the carrier ribbon (14) is

entrained about the peeler device (24) so as to pass over the peeler device (24) during a printing operation subsequent to passing the print head (22), and when the apparatus (10) is operated in the second configuration and the carrier ribbon (14) and substrate (15) are moved in the second direction relative to the print head (22) during a printing operation the print head (22) and associated peeler device (24) is positioned in a first position such that the carrier ribbon (14) is entrained about the peeler device (14) so as to pass over the peeler device (24) during a printing operation subsequent to passing the print head (22).

7. An apparatus according to any one of the preceding claims characterised in that the second motor (25) is coupled to the take-up spool (16) via an overdrive clutch and the second motor (25) drives a drive roller (17) around which the carrier ribbon (14) is entrained, whereby the carrier ribbon (14) may be advanced onto the take-up spool (16) when the drive roller (17) is driven.

8. An apparatus according to any one of the preceding claims characterised in that the supply (12) and take-up spools (16), and guides (17, 18, 19, 20) which guide the carrier ribbon (14) at least partially along a carrier ribbon feed path are mounted on a base (11), and a transmission (26, 27) which includes a rotary to linear drive transfer mechanism is also mounted on the base (11) whereby in the first configuration the print head (22) is carried by a linearly movable part (27), the apparatus (10) being re-configurable from the first to the second configuration by disconnecting the transmission (26, 27) from the print head (22), fixing the print head (22) relative to the base (11), and entraining carrier ribbon (14) around guides (35, 36) on the linearly movable part and around guides (17, 18, 19, 20) which are immovable relative to the base (11).

9. A printing apparatus according to any one of the preceding claims characterised in that when the apparatus (10) is operated in at least the first

configuration, the print head (22) is moved towards the adjacent carrier ribbon (14) and substrate (15) during printing to urge the carrier ribbon (14) towards the substrate (15), and the print head (22) is moved away from the carrier ribbon (14) and substrate (15) after printing, and wherein the print head (22) movement towards and away from the carrier ribbon (14) is achieved as the print head (22) is moved by the first motor (13) by mechanical guide means including a cam and track.

10. A printing apparatus including a carrier ribbon supply spool (12) and a carrier ribbon take-up spool (14), a print head (22) having a plurality of heating elements which are individually addressable and energisable selectively to remove pixels of marking medium from the carrier ribbon (14) during a printing operation, a first motor (13) to move the carrier ribbon (14) relative to the print head (22) during a printing operation, and a second motor (25) to advance carrier ribbon (14) from which pixels of marking medium have been removed in a previous printing operation, onto the carrier ribbon take-up spool (14), characterised in that the carrier ribbon (14) is moved past the print head (22) inbetween printing operations to advance used ribbon onto the take-up spool (16) in a direction opposite to the direction the ribbon (14) is moved during a printing operation, and inbetween printing operations, a carrier ribbon (14) length is advanced past the print head (22) generally equal to the length of carrier ribbon (14) used in the preceding printing operation plus the length of carrier ribbon (14) to be used for the next printing operation.

11. A printing apparatus according to claim 10 which has any of the features of the printing apparatus (10) according to any one of claims 1 to 9.

12. A printing apparatus including a carrier ribbon supply spool (12) and a carrier ribbon take-up spool (16), a print head (22) having a plurality of heating

elements which are individually addressable and energisable selectively to remove pixels of marking medium from the carrier ribbon (14) during a printing operation, a first motor (24) to move the carrier ribbon (14) relative to the print head (22) during a printing operation, and a second motor (25) to advance carrier ribbon (14) from which pixels of marking medium have been removed in a previous printing operation, onto the carrier ribbon take-up spool (16), characterised in that in a first mode of operation when the substrate (15) moves relative to the print head (22) during a printing operation in a first direction (A), the carrier ribbon (14) moves in the same direction as the substrate (15), and in a second mode of operation when the substrate (15) moves relative to the print head (22) during a printing operation in a second direction, the carrier ribbon (14) moves in the same direction as the substrate (15), and in the first mode of operation where the substrate (15) moves in the first direction (A) during a printing operation, inbetween printing operations, a length of the carrier ribbon (14) is advanced past the print head (22) which is generally equal to the length of carrier ribbon (14) used in the preceding printing operation plus the length of carrier ribbon (14) to be used for the next printing operation, and in the second mode of operation when the substrate (15) moves relative to the print head in a second direction during a printing operation, inbetween printing operations the carrier ribbon (14) is generally stationary relative to the print head (22).

13. A printing apparatus according to claim 12 having any of the features of the printing apparatus of any one of claims 1 to 11.

14. A printing apparatus including a carrier ribbon supply spool (14) and a carrier ribbon take-up spool (16), a print head (22) having a plurality of heating elements which are individually addressable and energisable selectively to remove pixels of marking medium from the carrier ribbon (14) during a

printing operation, the print head (22) being movable towards the adjacent carrier ribbon (14) and substrate (15) during printing to urge the carrier ribbon (14) towards the substrate (15), and the print head (22) is moved away from the carrier ribbon (14) and substrate (15) after printing, and wherein the print head (22) movement towards and away from the carrier ribbon (14) is achieved as the print head (22) is moved by the first motor (24) via mechanical guide means including a cam and track.

15. A printing apparatus according to claim 14 having any of the features of the printing apparatus according to any one of claims 1 to 13.

16. A method of printing using a printing apparatus (10) including a carrier ribbon supply spool (14) and a carrier ribbon take-up spool (16), a print head (22) having a plurality of heating elements which are individually addressable and energisable selectively to remove pixels of marking medium from the carrier ribbon (14) during a printing operation the carrier ribbon (14) being movable relative to the print head (22) during a printing operation, and there being a motor (25) to advance carrier ribbon from which pixels of marking medium have been removed in a previous printing operation, onto the carrier ribbon take-up spool (16), characterised in that the method includes moving the substrate (15) relative to the print head (22) during a printing operation in a first direction (A), and moving the carrier ribbon (14) in the same direction as the substrate (15), and moving the carrier ribbon (14) inbetween printing operations in a second opposite direction, the method including, inbetween printing operations, advancing a length of the carrier ribbon (14) past the print head (22) which is generally equal to the length of carrier ribbon (14) used in the preceding printing operation plus the length of carrier ribbon (14) to be used for the next printing operation.

17. A printing apparatus substantially as hereinbefore described with reference to figure 1 or figure 2 or figure 3 of the accompanying drawings.
18. A method of printing substantially as hereinbefore described with reference to the accompany drawings.
19. Any novel feature or novel combination of features described herein and/or as shown in any of the accompanying drawings.